

**REMARKS**

In the Office Action, claims 1-4 were rejected. Reconsideration and allowance of all pending claims are requested.

All of the independent claims 1, 3 and 4 specifically recite, in generally similar language, determining whether a rub is occurring in a turbomachine. The claims were all rejected in view of a single reference, Published Patent Application No. 2003/0222604 ("Twerdochlib"). Applicants submit that Twerdochlib fails to teach determining whether a rub is actually occurring, and indeed is designed to avoid all such situations. Moreover, due to its very design, the Twerdochlib system is incapable of such determination, and would be destroyed by an actual rub.

**Response to examiner's additional comments made in the final Office Action.**

In the final Office Action, the Examiner stated that the Applicants' arguments with respect to the amended claims presented in the previous Office Action Response have been considered. The Examiner further restated the Applicants' arguments that the prior art does not determine "whether a rub is occurring." The Examiner then again argued that Twerdochlib discloses "whether a rub is occurring" on page 3, sections 47-50. The Examiner further stated that section 48 specifically teaches indicating whether a rub is occurring.

The cited passages at page 3, sections 47-50 read:

[0047] 17 Alert\_Level>R\_T goto 1 (no rub will occur between blade ring and blade tip)

[0048] 18 Energize Alert Relay (*if not 17 rub will occur*) (repeat process)

[0049] 19 go to 1 (make next measurement)

[0050] The alert level is determined by the computer based on the turbine condition, i.e., at turning gear, 132 minutes after a full load trip or at 2 minutes into spin cool cycle following 31 minutes at turning gear following full load unit trip. Under these conditions, the assigned radial translation for the alert level implies a rub will occur between the blade's tip and the blade ring at or below the alert level measurement.

Twerdochlib, paragraphs 47-50 (emphasis added).

There can be no misunderstanding the plain meaning of these passages. By stating “*if not 17 rub will occur*” in paragraph 48, Twerdochlib clearly does not indicate that a rub *is actually occurring* or has already occurred. The statement of “*if not 17 rub will occur*”, on the contrary, is a conditional scenario described in future tense. Even the grammatical interpretation of the statement “*if not 17 rub will occur*” indicates that a rub may occur *only in future*. When the condition is determined and the alarm made, no rub will actually have ever occurred.

#### **Detailed analyses of the Twerdochlib system.**

Applicants respectfully reiterate the arguments presented in the previous Office Action Response for the sake of completeness and thereby reassert that the present invention, as recited in independent claims 1, 3 and 4, is patentable over Twerdochlib.

#### **Independent Claim 1.**

Claim 1 recites, *inter alia*, a system for detecting rub in a turbomachine. The system includes a turbomachine, sensors monitoring turbomachine conditions and an on site monitor in communication with the sensors, and loaded with instructions to implement a method for detecting *whether rub is occurring* in the turbomachine of manufacturing an article.

**Twerdochlib fails to teach a method for detecting *whether a rub is occurring*.**

The Examiner suggested that Twerdochlib is believed to teach the recited method. The Examiner cited passages at page 3, section 50 in support of the rejection, for example. Section 50 is quoted in its entirety above. However, it must be read in conjunction with the accompanying passages also reproduced above.

The cited passages from Twerdochlib does not support the Examiner's position. Applicants respectfully submit that Twerdochlib teaches a method of detecting the *clearance between a rotating blade and a stationary portion of a turbo-machine* as opposed to detecting "rub". The distinction between "clearance" and "rub" is apparent from passages of the present application, particularly paragraph 2, lines 10 – 14, and paragraph 3, lines 4 – 8.

The passage from paragraph 2, lines 10-14 of the application reads:

From the standpoint of thermodynamic efficiency, it is desirable that the clearance between the stator blade tips and the seals on the rotor surface, and between the rotating blade tips and the seals on the shell be maintained at a minimum so as to prevent excessive amounts of fluid from bypassing the row of rotating blades and stator blades.

The passage from paragraph 3, lines 4 – 8 of the application reads:

If insufficient tip clearance is provided at assembly, impact between the stator blade tips and rotor seals and impact between the seals on the shell and the rotating blade tips may occur when certain operating conditions are reached. These impacts are commonly known as "rubs."

The method of detection of clearance as disclosed by Twerdochlib includes positioning an eddy current coil proximate a position of a stationary portion of a turbo-machine traversed by a rotating blade during operation of the turbo-machine, providing

an electrical signal to excite the eddy current coil, detecting an excitation response of the eddy current coil, and characterizing clearance between the rotating blade and the stationary portion based on the excitation response.

In other words, the method taught by Twerdochlib relates to a situation where a contact between two rubbing surfaces “*will occur*”, but clearly never actually occurs. The reference primarily relates to blade clearance and its measurement method. Blade clearance and its measurement method are thus the central subjects of the Twerdochlib reference. This is clear from a passage at page 2, section 23. The passage reads:

Blade clearance is measured relative to the zero position by advancing the insertion probe to a pre-selected radial distance from the blade, or reference position. For example, the pre-selected radial distance is 0.010 in (0.254 mm). This is the distance where the search coil signal peak amplitude indicates the longest blade is within the pre-selected distance of the insertion probe. The distance of the blade from the stationary member is then calculated from the motor step angle and screw pitch using the equation:

Radial translation=(Number of motor steps) ×(Motor Rev Per Step)×(Inch/mm per thread)

Twerdochlib, page 2, Section 23.

The method claimed in the present application, on the other hand, relates to detection of actual contact when it happens.

Further, Applicants respectfully submit that the method taught by Twerdochlib employs a technique involving eddy current testing systems coupled to pulsed eddy current probes for detecting voids, cracks, and corrosion in metal objects, as described on page 1, section 7 of the reference. The method ceases to work when actual contact between two rubbing surfaces occurs. Indeed, the sensing devices would be destroyed by such contact.

Twerdochlib teaches, such as on page 3, section 50, how the detection system and method go into a non-detecting sleep mode when an actual contact would ever occur.

The passage reads:

Electrical continuity of the search coil 30 is continually monitored by the computer 50. Should electrical continuity or the proximity signal be lost as a result of unplanned contact with the blade, the insertion probe is returned to a retracted position and placed in a "sleep" mode.

Twerdochlib, page 3, section 50.

Thus, the system is actually designed specifically to *stop detecting clearance and retract* even before any actual rub can occur.

Because Twerdochlib teaches detecting clearance and not whether rub is occurring, Twerdochlib cannot anticipate independent claim 1. Thus, it is respectfully requested that the rejection of claim 1 under 35 U.S.C 102(e) be withdrawn.

**Independent Claim 3.**

Claim 3 recites, *inter alia*, a method for detecting rub in a turbomachine. Like claim 1, the method includes monitoring turbomachine conditions and determining *whether rub is occurring*.

As noted above with respect to claim 1, because Twerdochlib teaches detecting a "clearance" and not "whether rub is occurring" Twerdochlib cannot anticipate independent claim 3. Thus, it is respectfully requested that the rejection of claim 3 under 35 U.S.C 102(e) be withdrawn.

**Independent Claim 4.**

Claim 4 recites, *inter alia*, a storage medium encoded with a machine-readable computer program code for detecting *whether a rub is occurring* in a turbomachine. The storage medium includes instructions for causing a computer to implement a method that includes obtaining data indicating turbomachine conditions and determining *whether rub is occurring*.

Here again, because Twerdochlib teaches detecting a “clearance” and not “whether rub is occurring” Twerdochlib cannot anticipate independent claim 4. Thus, it is respectfully requested that the rejection of claim 4 under 35 U.S.C 102(e) be withdrawn.

**Rejections Under 35 U.S.C. § 103(a)**

Dependent claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Twerdochlib in view of Kikuchi et al. (U.S. Patent Application Publication 2003/0192328, hereinafter “Kikuchi”). Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. Applicants respectfully assert that the present invention, as recited in independent claim 1 is patentable over Twerdochlib in view of Kikuchi.

As discussed above for independent claim 1, Twerdochlib fails to teach detection of whether *rub is occurring* in the turbomachine. Kikuchi similarly fails to teach such analysis. Thus, neither Twerdochlib nor Kikuchi specifically teach, disclose, or suggest detection of whether *rub is occurring* in the turbomachine. Therefore, the *combination* of the references cannot render independent claim 1 or its dependent claim 2 obvious. Accordingly, Applicants respectfully submit that a *prima facie* case of obviousness cannot be supported by the references with respect to claim 2. Thus, it is respectfully requested that the rejection of claim 2 under 35 U.S.C 103(a) be withdrawn.

**Conclusion**

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this Application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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